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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/980,598	11/01/2001	Toshiya Yokogawa	5077-000073	5848

7590

03/26/2003

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EXAMINER

CAO, PHAT X

ART UNIT

PAPER NUMBER

2814

DATE MAILED: 03/26/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/980,598

Applicant(s)

YOKOGAWA ET AL.

Examiner

Phat X. Cao

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 09 December 2002.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1 and 3-12 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1 and 3-12 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☒ Certified copies of the priority documents have been received in Application No. PCT.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 7.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

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DETAILED ACTION

1. The cancellation of claim 2 in Paper No. 6 is acknowledged.

Claim Rejections - 35 USC § 112

2. Claims 1, and 3-12 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

- in the base claim 1, lines 4-5, a phrase “first semiconductor layers provided in plurality which functions as a carrier transit region [emphasis added]” is unclear because “layers” is a plural and “functions” is a singular.

- similarly, in the base claim 1, lines 6-9, a phrase “ second semiconductor layers, which is composed of delta doped layers provided in plurality, which includes a higher concentration of impurities for carriers than the first semiconductor layer, and which has a thinner film thickness than the first semiconductor layer [emphasis added]” is unclear because “layers” is a plural and “is”, “includes”, or “has” is a singular.

- claims 3-12 are rejected because they depend on claim 1.

Claim Rejections - 35 USC § 102

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3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless -

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1, 4-5 and 11-12 are rejected under 35 U.S.C. 102(b) as being anticipated by Suzuki (JP. 5-13445).

With respect to claims 1 and 4-5, Suzuki (Fig. 1 and abstract) discloses a semiconductor device made by providing on a substrate 11 an active region that function as a portion of an active element, wherein the active element is configured by alternately layering: first semiconductor layers 141 of undoped GaAs which are provided on the substrate, and second semiconductor layers 151 of delta doped GaAs each has a thinner film thickness than the first semiconductor layer; wherein the first and second semiconductor layers are made of same material (i.e., GaAs); wherein each of the first semiconductor layers 141 and each of the second semiconductor layers 151 has the same thickness (par. [0013] and [0014]); and wherein the concentration of impurities for carriers included in the second semiconductor layers 151 is substantially constant because they have the same doping Si in the same thickness.

It is noted that the second semiconductor layer 151 inherently has a higher concentration of impurities for carriers than the first semiconductor layer 141 because the second semiconductor layer 151 is composed of delta doped layer (delta Si doped GaAs) and the first semiconductor layer 141 is a non-doped layer (I-GaAs).

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With respect to claims 11-12, Suzuki's Fig. 1 further disclose a Schottky gate electrode 21 in Schottky contact with a portion of the upper surface of the first semiconductor layer (i.e., I-GaAs) at the upper most portion of the active region, source/drain electrodes 23/24 provided on the active region and sandwich the Schottky gate electrode, and third semiconductor layers 221 and 222, which are provided on the active region and sandwich the Schottky gate electrode 21, and which include a high concentration of impurities, and wherein the source and drain electrodes 23 and 24 are in ohmic contact with the third semiconductor layers.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 3 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki (JP. 5-13446) in view of Hiroyuki et al (JP. 06-349860).

With respect to claim 3, Suzuki does not disclose the first and second semiconductor layers having impurities concentration as claimed. However, it would have been obvious to provide the first and second semiconductor layers of Suzuki with the impurities concentration as

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claimed because it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

With respect to claim 8, Suzuki does not disclose an ohmic electrode providing an ohmic contact with a portion of the substrate. However, in view of teachings of Hiroyuki (Fig. 9), it would have been obvious to provide an ohmic electrode in ohmic contact with the substrate of Suzuki in order to ground the substrate, as taught by Hiroyuki (Fig. 9).

Allowable Subject Matter

7. Claims 6-7, 9-10 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, second paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

Response to Arguments

8. With respect to Suzuki (JP. 5-13446), Applicant argues that the first and second semiconductor layers 141 and 151 are not made of the same material because the Si doping layer 151 composed of As, but not Ga.

Applicant's arguments are not persuasive because Suzuki clearly states that "delta doped-layers 151 to 155, which are constituted by doping Si to the surfaces of these layers 141 to 146

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[emphasis added]" (abstract). Accordingly, because delta doped-layers 151 to 155 are formed by doping Si to the surfaces of GaAs layers 141 to 146, the delta doped-layers 151-155 would be composed of Si and GaAs.

Conclusion

9. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Phat X. Cao whose telephone number is (703) 308-4917. The Examiner can normally be reached on Monday through Thursday. If attempts to reach the Examiner by

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telephone are unsuccessfully, the Examiner's supervisor, Wael Fahmy, can be reached on (703) 308-4918.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist whose telephone number is (703) 308-0956. Group 2800 fax number is (703) 308-7722 or (703) 308-7724.

PC
March 23, 2003


PHAT X. CAO
PRIMARY EXAMINER